

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY



(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 28 FEB 2006

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Applicant's or agent's file reference WO 21.1189		<b>FOR FURTHER ACTION</b>		See Form PCT/IPEA/416
International application No. PCT/EP2005/001436		International filing date (day/month/year) 08.02.2005		Priority date (day/month/year) 18.03.2004
International Patent Classification (IPC) or national classification and IPC E21B47/08				
Applicant SERVICES PETROLIERS SCHLUMBERGER et al.				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 3 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand  13.10.2005		Date of completion of this report  01.03.2006		
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized Officer  Schouten, A  Telephone No. +31 70 340-4088 		

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/EP2005/001436

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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

**Description, Pages**

1-11 as originally filed

**Claims, Numbers**

1-21 filed with telefax on 18.01.2006

**Drawings, Sheets**

1/7-7/7 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-21
	No: Claims	
Inventive step (IS)	Yes: Claims	1-21
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-21
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

- 1 Reference is made to the following documents:

D1 : WO 02/101194 A (MAUTE ROBERT ; REM SCIENT ENTPR INC (US)) 19  
December 2002 (2002-12-19)  
D2 : US 5 631 562 A (CRAM MILTON E ET AL) 20 May 1997 (1997-05-20)  
D3 : US 4 862 090 A (VANNIER DANIEL ET AL) 29 August 1989 (1989-08-29)

- 2 The document D1 is regarded as being the closest prior art to the subject-matter of independent claim 1, and shows:

A borehole logging tool comprising a sensor loop. The sensor loop includes a series of contiguous sensors that act as electromagnetic flowmeters and provide fluid measurements covering the entire circumference of the sensor loop. The sensor loop includes an elastic element that forces the sensor loop outward to maintain pressure along the sensor loop circumference against the interior borehole wall. The sensor loop is designed to lie at a non-perpendicular angle to the wellbore axis, and mechanical arms press the top and bottom of the loop against the borehole inner wall (see also figures 3 and 3a of D1).

The subject-matter of claim 1 differs from this known logging tool in that the claimed logging tool comprises:

- pads that are pivotable about a radial axis relative to the tool body, and the pads are elongate pads adjacently arranged to provide different circumferential coverage according to the orientation with respect to the longitudinal axis of the borehole.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

- 2.1 The problem to be solved by the present invention may be regarded as: providing constant total circumferential coverage with a logging tool having pads in boreholes with different diameters and shapes.
- 2.2 The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons: by allowing the pads to rotate about a radial axis relative to the tool body, the orientation of the pads can be changed to adjust the actual amount of circumferential coverage by the pads and so accommodate different borehole diameters and shapes while providing the same degree of circumferential coverage (see paragraph [0006] of the application as originally filed).
- 2.3 Claims 2-19 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.
- 2.4 Since the subject-matter of independent claims 20 and 21 corresponds to the subject matter of claim 1, the same reasoning as given for claim 1 will apply mutatis mutandis. Therefore claims 20 and 21 also meet the requirements of the PCT in respect of novelty and inventive step (Article 33(2) and (3) PCT).

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## CLAIMS

- 1 A borehole tool, comprising: a tool body; a series of arms connected to the tool body and moveable radially relative thereto; and a series of pads mounted on the arms so as to be pivotable relative thereto;  
5 characterised in that the pads are pivotable about a radial axis relative to the tool body, and the pads are elongate pads adjacently arranged to provide different circumferential coverage according to the orientation with respect to the longitudinal axis of the borehole.
- 2 A tool as claimed in claim 1, the pads are connected to the arms  
10 such that the orientation of the pads relative to the tool body is determined by the extent of the arms in the radial direction.
- 3 A tool as claimed in claim 1 and 2, wherein the pivoting of pads is synchronised such that the pads adopt a substantially regular pattern of orientation.
- 15 4 A tool as claimed in claim 3, wherein adjacent pads are interconnected so as to synchronise pivoting.
- 5 A tool as claimed in any preceding claim, wherein the pads are arranged in a ring, each pad being connected at its ends to the adjacent pads.
- 20 6 A tool as claimed in any preceding claim, wherein the arms are arranged symmetrically around the tool body.
- 7 A tool as claimed in any preceding claim, wherein each arm is connected to the tool body at one end by a pivot or hinge that allows the arm to move in a radial plane relative to the tool body.
- 25 8 A tool as claimed in any preceding claim, wherein the ends of the arms are be connected to the pads.
- 9 A tool as claimed in any preceding claim, wherein the arms can move between two limit positions: the first in which the arm lies substantially parallel to the tool body; and the second in which the  
30 arm projects away from the tool body in a radial direction to contact the borehole wall.

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- 10 A tool as claimed in any preceding claim, wherein the series of arms comprises two sets of arms separated along the tool body with the series of pads encircling the body between the sets of arms.
- 5 11 A tool as claimed in claim 10, wherein the arms of each set extend from the connection on the tool body towards the other set.
- 12 A tool as claimed in claim 11, wherein the two sets of arms are arranged on the tool body in an angularly offset configuration.
- 10 13 A tool as claimed in claim 12, wherein the pads are connected to the arms in such a way that one end of a pad is connected to an arm from the first set and the other end of the pad is connected to the adjacent arm of the second set.
- 14 A tool as claimed in any preceding claim, wherein the pads form a zigzag array extending around the circumference of the borehole.
- 15 15 A tool as claimed in claim 14, wherein each arm is connected to two pads at adjacent ends.
- 16 A tool as claimed in any of claims 10-13, wherein the ends of one set of arms are located in a fixed position on the tool body and the ends of the other set are located on the tool body by means of a sliding ring which can be driven along the tool body to cause the arms of both sets to extend or retract.
- 20 17 A tool as claimed in claim 16, further comprising a detector for detecting the angle between any arm and the tool axis.
- 18 A tool as claimed in claim 16 or 17, wherein the location of the arms on the ring is provided so as to allow axial movement of the ends of the arms relative to the tool body.
- 25 19 A tool as claimed in claim 18, further comprising a detector for detecting the axial position of the ring and the location point of each arm.
- 20 20 The use of a tool as claimed in any of claims 17, 18 or 19 to determine the size of a borehole in which it is positioned.
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- 21 The use of a tool as claimed in claim 18 or 19 to determine the shape of a hole in which it is positioned.